

given a sketch of the groups or natural orders in which Prof. Huxley arranges the *Invertebrata*, the classification of which is surrounded with so many difficulties, that scarcely any two writers on classification adopt the same taxonomic system. Prof. Huxley does not look upon the arrangement he has adopted as more than temporary, as our knowledge of the anatomy and development of the *Invertebrata* is increasing with such prodigious rapidity that the views of taxonomists in regard to the proper manner of expressing that knowledge by classification are undergoing, and for some time to come are likely to undergo, incessant modifications.

We heartily commend this book to all students of Comparative Anatomy.

EVERETT'S "TEXT-BOOK OF PHYSICS"

Elementary Text-Book of Physics. By J. D. Everett, M.A., D.C.L., F.R.S.E., Professor of Natural Philosophy in the Queen's College, Belfast. (Glasgow: Blackie, 1877.)

IN the preface to this book the author says: "It is primarily intended as a text-book for elementary classes of Physics. It aims at presenting, in brief space, those portions of theoretical physics which are most essential as a foundation for subsequent advances, while at the same time most fitted for exercising the learner in logical and consecutive thought. It does not give minute directions for manipulation, but, avoiding details as much as possible, presents a connected outline of the main points of theory. . . . The aim must be not so much to teach them [the bulk of the boys in our public schools] many facts, as to teach them rightly to connect a few great facts together. . . . The book is not intended to supersede oral instruction, but rather to create a demand for amplification and illustration such as the teacher will supply."

Judged from this point of view the text-book must receive almost unqualified praise. The different divisions of the book treat respectively of the subjects, dynamics (in its modern acceptation), hydrostatics, heat, light, sound, and electricity including magnetism, and in each division the author explains the leading facts in clear, concise, and accurate language. What mathematics is introduced is of the simplest possible kind, and need not prevent the veriest tyro in geometry and algebra, provided he is possessed of ordinary intelligence, from reading and understanding the book from beginning to end. The definitions are, as a rule, very exact, and the explanation of the units, as might have been expected from the author of the pamphlet, the "centimetre-gramme-second system of units" is singularly precise. Add to this that the diagrams are numerous, and, which is of rare occurrence in an English text-book, of unusual excellence, and that each division is followed by a collection of examples (except the last, which apparently has not been thought worthy of the honour) at once good and easy, and enough has been said to show that the text-book is one with many merits.

It has its demerits too, and if we dwell longer on them it is only in the hope that a truly excellent manual may be rendered still more excellent in a second edition. Why does the author make not the slightest mention of

Newton's laws of motion, although all the statements made in them are asserted, but in such a casual off-hand sort of way that the student wonders what is the evidence for such important statements? For example, in Art. 9 it is said "If a body with a movement of translation (unaccompanied by rotation) is acted on either by no forces or by balancing forces, it continues to move with uniform velocity in a straight course." This assertion is introduced by no explanation, neither is it followed by any remark or illustration. The same thing may be said, and even more forcibly, of the treatment which the second law receives. This fault, of making assertions without any explanation or shadow of proof, is rather too apparent throughout the book, as a few instances will show. The examples are taken from pages that are all near together. At p. 147, line 4, we read, "the last image consists of two coincident images, as has already been shown [for 'shown' read 'asserted'] to be the case when the angle is a right angle." Again, at p. 150, line 3, it is said, "The angles of incidence and refraction increase together and the deviation increases with them." At p. 153, after a description of Airy's simple and beautiful apparatus for illustrating refraction, it is added "ABC will be the path of a ray, and a stud at C will appear in the same line with studs at A and B." At p. 158, line 9 from bottom, we find—"If the eye is moved with uniform velocity from one side of the normal to the other (in one straight line), the image moves with a velocity continually diminishing till the normal is reached, becoming zero at the normal, and then again gradually increasing. This is a general property of geometrical images, whether formed by refraction or reflection. . . ." At p. 161, line 1:—" . . . The rays reflected from the outer portions of the mirror will fall sensibly short of the middle point of OC. If the point of incidence be supposed to travel with uniform velocity along the arc MO from M to N, the intersection of the reflected ray with OC will move towards F with velocity gradually diminishing to zero." Once more, on p. 163, last line, and p. 164, first three lines, we read:—" . . . It can be shown that if the angular aperture be small all the reflected rays will meet sensibly in one point, F." It can also be shown that—

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Although it is not to be expected that any other seventeen pages will supply [as many examples as these, still such faults do occur throughout the book. We do not object to statements heralded by the words "It can be shown," as the student is at once put on his guard, and virtually referred to other sources for the proof, if he wishes it; but most frequently he is left either to take the statement on trust, or, in the words of the preface, "to exercise his mind in logical and consecutive thought." Only we think that in the latter case the text-book can hardly be called one "for elementary classes."

From inaccuracies the book is wonderfully free, but there is surely one, and not a small one, about harmonics at the bottom of p. 241. The author asserts that the origin of harmonics depends on two very different causes. Sometimes it is found in the different modes of free vibration of the body which emits the sound (and this is especially the case with the sounds of stringed instru-

ments), but in other cases (including the tones of the siren, and the human voice) it depends on a very different cause, namely, the mathematical law that every series of precisely similar vibrations is either simple, or compounded of one set of simple vibrations, giving the fundamental tone, and other sets of simple vibrations giving the harmonics." Now the second cause—Fourier's law—is surely the only one for the existence of harmonics, and in every vibration, whether of a string or any other body, the ear analyses the motion of the air in accordance with the law, that is, hears harmonics. Is it possible that the origin of the misconception here lies in the old notion that when a string vibrates in any regular manner there are secondary waves riding on the primary ones, another set on these secondary, and so on? as—

"Great fleas have little fleas
Upon their backs to bite 'em,
The little fleas have lesser fleas,
And so ad infinitum."

By the way, why are the notes of the human voice, which are produced by the vibrations of the vocal chords, distinguished from the notes of stringed instruments?

It is not to be expected in an elementary manual that every subject, even of importance, should be noticed, but we should have thought that even in the briefest treatise on heat, some notice would have been taken of the "theory of exchanges," and yet we find no mention whatever made of it. Also a little more space than two pages might have been devoted to the electric telegraph, especially, first, as room has already been found for the description of the venerable three kinds of lever, and the antiquated three systems of pulleys (which are rarely seen except in text-books of physics); and, secondly, inasmuch as three times the space is taken up in the description of the air-pump and its modifications.

The good qualities of the book are so conspicuous, and its faults either so slight or so easily corrected by the teacher, that we have no hesitation in warmly recommending it as a good text-book for junior classes.

T. H. C.

OUR BOOK SHELF

Popular British Fungi; containing Descriptions and Histories of the Principal Fungi, both Edible and Poisonous, of our Country. Illustrated. By James Britten, F.L.S. (London: the Bazaar Office.)

THIS admirable little book forms an agreeable and popular introduction to a much neglected group of plants. Written in a pleasant easy style, it yet conveys a great deal of sound information. Mr. Britten having drawn on his imagination merely for the setting of his facts, not for the facts themselves. The different illustrations convey a tolerably accurate idea of the plants represented. The edible fungi are carefully described, and most useful hints and directions given as to the modes of cooking and preparing for table. The poisonous forms also receive a considerable share of attention, and the characters are carefully given, but even with all sorts of descriptions we cannot but think that there is always danger from such genera as *Lactarius* and *Russula*. Besides treating of the usual edible and poisonous fungi, Mr. Britten gives a chapter on Dry Rot, another on Luminous Fungi, and another on the Sphaeriacei. Throughout the whole book we constantly meet with quaint quotations from old authors. The book, then, is not only a very pleasant and

readable one, but conveys a great deal of sound information on the subject therein treated.

Zeitschrift für das chemische Grossgewerbe. Herausgegeben von Jul. Post. II. Jahrgang. Heft I. (Berlin: Robt. Oppenheim.)

WE have already had occasion to express our high opinion of the value of Dr. Post's contributions to chemical technology. The present work is to the chemical manufacturer what the well-known "Jahresbericht" of Liebig and Kopp is to the scientific chemist. It attempts to give the technologist a systematic account of the latest advances in the several departments of manufacturing chemistry and the allied arts. As the various contributions are from the pens of men who, in the majority of cases, have made the matters upon which they write the objects of special attention and study, we can confidently recommend the work to the notice of our chemical manufacturers.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications. The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Indian Rainfall Statistics

SEVERAL correspondents in the *Times* and elsewhere have lately complained regarding the class of information furnished by the Government of India with reference to the famine. One of them pointed out that while the Indian official *Gazette* is filled with tables of food-prices, and other statistics, there seems to be no attempt to deduce the real significance of those figures, nor are any data of comparison offered by which the public might make deductions for themselves. I have just come across a very glaring instance of this. The Indian rainfall having been discussed a good deal this summer in your columns, I heard with some rejoicing that a long list of returns had been given in the Indian *Gazette* for stations in Madras and Bombay. The returns purport to bear upon the variation of rainfall in tropical India with reference to the cycle of sun-spots. As an old resident in Madras and Hyderabad, I think it would be difficult to produce a series of figures more irrelevant or more misleading with regard to the matter in hand. So far as I understand your articles, it is alleged that of the six famines in Southern India since 1810, five were caused by great droughts at the periods of minimum sun-spot frequency. It also seems to be alleged by you that the rainfall at Madras itself follows a cycle curiously coincident with the eleven-year cycle of sun-spots. These are two propositions distinct in themselves, and either of them is well worthy of investigation by the Meteorological Reporter to the Government of India.

The figures signed by that officer in the *Gazette* yield no information on the subject. He begins by completely mis-stating the case. Instead of testing the one statement as to whether drought and famine in Southern India have been coincident with periods of minimum sun-spots, or the other statement as to whether the rainfall at Madras itself forms a cycle coincident with the sun-spot cycle, he assumes that the question at issue is whether the rainfall at all the stations throughout Southern India shows a common periodicity coincident with the cycle of sun-spots.

Now, sir, it surely displays a gross ignorance with regard to the geographical facts of Southern India, to suppose that a periodicity, or any other feature of the rainfall of a place on the coast, like Madras, can be reproduced at the stations which the paper seems to take haphazard at the inner recesses beyond the Ghauts. I shall take, for example, only three stations in which I have resided, and whose monsoons I have seen. Madras derives about two-thirds, or twenty-nine inches, of its total rainfall from the north-eastern monsoon between October and December. The periodicity of its total annual rainfall is chiefly due to this monsoon. The Calcutta meteorological reporter compares this station with Secunderabad, where the north-